

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 09-240110

(43)Date of publication of application : 16.09.1997

(51)Int.Cl.

B41J 29/377
B41J 2/32
// H01R 9/09

(21)Application number : 08-047758

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(22)Date of filing : 05.03.1996

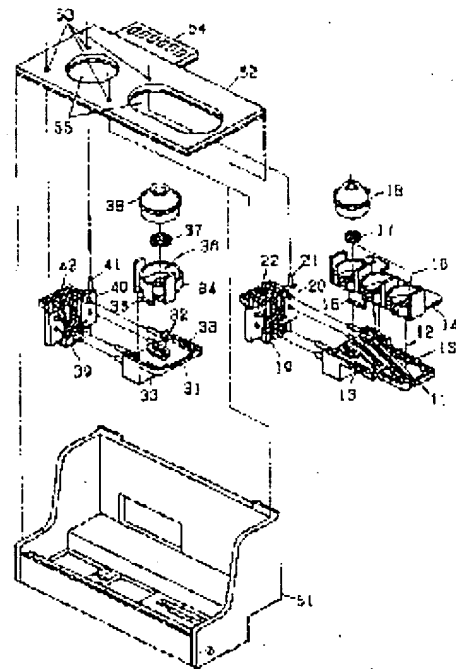
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(54) PRINTING HEAD

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a lightweight printing head at a low cost.

SOLUTION: Head chips 19, 39 are mounted on individual heat sinks 20, 40 smaller than conventional heat sink. Assemblies of manifold members 11, 31 and joint members 14, 34 are assembled on the individual heat sinks 20, 40 so as to form printing head sub-assemblies. The printing head sub-assemblies are bonded to a common heat sink 52 thermally with positioning pins 21, 41 of the individual heat sinks 20, 40 and fitting holes 53 of the common heat sink 52 fitted. Heat generated in the head chips 19, 30 is diffused by the individual heat sinks 20, 40 and the common heat sink 52. Since the common heat sink 52 may be large enough to diffuse the heat generated by one head chip, the heat sink can be compact and lightweight.



LEGAL STATUS

[Date of request for examination] 25.05.2001

[Date of sending the examiner's decision of rejection] 09.07.2002

[Kind of final disposal of application other than
the examiner's decision of rejection or
application converted registration]

[Date of final disposal for application]

[Patent number] 3381505

[Date of registration] 20.12.2002

[Number of appeal against examiner's
decision of rejection] 2002-15167

[Date of requesting appeal against examiner's
decision of rejection] 08.08.2002

[Date of extinction of right]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the thermal print head which comes to constitute two or more head chips in one especially about the print head which has a head chip possessing a heating element.

[0002]

[Description of the Prior Art] For example, in the thermal ink jet printer or the thermal printer, it has the heating element for the head chip prepared in the print head. In a thermal ink jet printer, this heating element is made to generate heat, air bubbles are generated in ink, and it records by making ink fly to recorded media with the pressure at the time of air bubbles growing. Moreover, in a thermal printer, a heating element is made to generate heat, melting of the ink of an ink ribbon is carried out, and it records by imprinting ink to recorded media, or records by heating recorded media directly.

[0003] In such a print head, unless it carries out stripping of the heat generated in the heating element of a head chip, record which the head chip heated and was stabilized cannot be performed. Therefore, the heat sink which radiates the heat generated by record is prepared in each head chip.

[0004] On the other hand, by the printer in which for example, color record and gradation record are possible, two or more head chips are arranged to the print head. Conventionally, as structure of the print head which comes to constitute two or more head chips in one, a heat sink is attached in each head chip for monochrome or two or more colors, a print head subassembly is constituted, and what positioned and assembled two or more print head subassemblies in housing is known.

[0005] Drawing 2 is the decomposition perspective view showing an example of the print head of the conventional thermal ink jet mold. 11 among drawing a crevice and 13 for the manifold member for colors, and 12 A hole, 14 a claw part and 16 for the joint member for colors, and 15 Color ink induction, In 17, a filter and 18 the head chip for colors, and 31 for joint material and 19 The manifold member for blacks, In 32, a crevice and 33 the joint member for blacks, and 35 for a hole and 34 A claw part, 36 -- black ink induction and 37 -- for the head chip for blacks, and 61, as for the heat sink for blacks, and 63, the heat sink for colors and 62 are [a filter and 38 / joint material and 39 / housing and 64] common connector area material. The example shown in drawing 2 shows the example of the thermal ink jet print head of a color which uses the ink of two or more colors. Here, black ink is used apart from the color ink of three colors.

[0006] The head chip 19 for colors is attached in the heat sink 61 for colors. Furthermore, the joint member 14 for colors is joined to the manifold member 11 for colors, it is attached in the heat sink 61 for colors, and the print head subassembly for colors is formed.

[0007] In the joint member 14 for colors, it has three color ink induction 16 so that it may connect with the ink tank of each color. A filter 17 and the joint material 18 are formed in each color ink induction 16. The joint section of three ink tanks which are not illustrated is pressed by the color ink induction 16 which corresponds, respectively. At this time, the joint material 18 is pressed by the joint periphery of each ink tank, and ink passage is constituted.

[0008] The crevice 12 which forms the ink supply way for every color is established in the manifold member 11 for colors, and an ink supply way is formed by joining the joint member 14 for colors with adhesives. In this example, the claw part 15 is formed in the joint member 14 for colors, it engages with the hole 13 of the manifold member 11 for colors, and bonding strength is generated. An ink supply way supplies the ink introduced from the color ink induction 16 to the head chip 19 for colors.

[0009] The heat sink 61 for colors consists of metal substrates with which wiring for supplying power and a control signal, the signal of the image which should be recorded, etc. to the head chip 19 for colors etc. was prepared. The drive circuit for driving a heating element in accordance with the image to record etc. may be prepared. The heat sink 61 for colors and the head chip 19 for colors are electrically connected by wirebonding etc. Moreover, it sticks with high temperature conductivity binders, such as for example, silver epoxy, and is combined thermally, and this heat sink 61 for colors and the head chip 19 for colors radiate heat in the heat generated with the head chip 19 for colors.

[0010] The head chip 19 for colors has three independent ink rooms, and carries out the regurgitation of each ink from every two or more nozzles which are open for free passage in each ink room. Thereby, three colors are recordable on a field different, respectively at coincidence. As a color of the color ink to be used, it can consider as cyanogen, a Magenta, and yellow, for example.

[0011] It is a configuration with the same said of black, and the head chip 39 for blacks is attached in the heat sink 62 for blacks, and the joint member 34 for blacks is further joined to the manifold member 31 for blacks, it is attached in the heat sink 62 for blacks, and the print head subassembly for blacks is formed.

[0012] In the joint member 34 for blacks, it has the black ink induction 36 so that it may connect with the ink tank of black. A filter 37 and the joint material 38 are formed in the black ink induction 16. Since black ink is used well, in order to make [many] a flow rate, these members are somewhat formed on a large scale rather than the thing for colors.

[0013] The crevice 32 which forms an ink supply way is established in the manifold member 31 for blacks, and an ink supply way is formed by joining the joint member 34 for blacks with adhesives. In this example, the claw part 35 is formed in the joint member 34 for blacks, and it engages with the hole 33 of the manifold member 31 for blacks, and fixes. An ink supply way supplies the ink introduced from the black ink induction 36 to the head chip 39 for blacks.

[0014] The heat sink 62 for blacks is the same as the above-mentioned heat sink 61 for colors almost, and consists of metal substrates with which wiring for supplying power and a control signal, the signal of the image which should be recorded, etc. to the head chip 39 for blacks etc. was prepared. It sticks, for example with high temperature conductivity binders, such as silver epoxy, and is combined thermally, and the heat sink 61 for blacks and the head chip 19 for blacks radiate heat in the heat generated with the head chip 19 for blacks while wirebonding etc. connects electrically.

[0015] The print head subassembly for colors and the print head subassembly for blacks which were assembled as mentioned above are attached to housing 63. At this time, it fits in with the slot currently formed in housing 63, and positioning of each print head subassembly is made. Finally the common connector area material 64 is attached, and wiring and the body of a printer which are formed on the heat sink 61 for colors and the heat sink 62 for blacks are connected electrically.

[0016] As another example, the substrate which is a head chip is attached in metal large-sized base materials, such as aluminum, an ink jet head unit is constituted, four ink jet head units are contained in housing, and the recording head unit consists of recording head units indicated by JP,7-81046,A.

[0017] In such a print head, in order to carry out stripping of the heat generated with each head chip, the heat sink is needed for every print head subassembly, respectively. Therefore, in the recording head unit which has the large-sized heat sink only for the number of the print head subassembly constructed in housing, for example, is indicated by JP,7-81046,A, it has the metal large-sized heat sink (base material) of four sheets. Consequently, while the print head became expensive, there was a problem of becoming heavy.

[0018]

[Problem(s) to be Solved by the Invention] This invention was made in view of the situation mentioned

above, and aims at offering a cheap and lightweight print head.

[0019]

[Means for Solving the Problem] In the print head which has two or more head chips possessing a heating element, invention according to claim 1 possesses a common heat sink common to each heat sink, and is characterized by combining the heat sink according to each [said] with said common heat sink thermally while it has the individual heat sink which said each head chip combined thermally, respectively.

[0020] Invention according to claim 2 is characterized by said common heat sink being the metal substrate in which electric wiring was formed on the metal base in a print head according to claim 1.

[0021] Invention according to claim 3 is characterized by connecting the electric wiring of each head chip to the electric wiring currently formed in said common heat sink in a print head according to claim 2.

[0022] Invention according to claim 4 is characterized by preparing the temperature sensing element common to said two or more head chips in said common heat sink in a print head given in claim 1 thru/or any 1 term of 3.

[0023]

[Embodiment of the Invention] Drawing 1 is the decomposition perspective view showing one gestalt of operation of the print head of this invention. Among drawing, the same sign is given to the same part as drawing 2, and explanation is omitted. 20 -- the individual heat sink for colors, and 21 -- a locator pin and 22 -- a contact pad and 40 -- the individual heat sink for blacks, and 41 -- for housing and 52, as for a fitting hole and 54, a common heat sink and 53 are [a locator pin and 42 / a contact pad and 51 / a connector area and 55] openings.

[0024] The head chip 19 for colors is attached in the individual heat sink 20 for colors. Furthermore, the joint member 14 for colors is joined to the manifold member 11 for colors, it is attached in the individual heat sink 20 for colors, and the print head subassembly for colors is formed. The head chip 39 for blacks is similarly attached in the individual heat sink 40 for blacks, and the joint member 34 for blacks is further joined to the manifold member 31 for blacks, it is attached in the individual heat sink 40 for blacks, and the print head subassembly for blacks is formed. The configuration of the manifold member 11 for colors, the joint member 14 for colors, the head chip 19 for colors, the manifold member 31 for blacks, the joint member 34 for blacks, and the head chip 39 for blacks is the same as usual. As color ink which carries out the regurgitation from the head chip 19 for colors, it can consider as three colors of cyanogen, a Magenta, and yellow. Of course, other colors are sufficient.

[0025] The head chip 19 for colors and the head chip 39 for blacks are mounted on the individual heat sink 20 for colors, and the individual heat sink 40 for blacks, respectively so that thermal resistance may decrease for example, with silver epoxy etc.

[0026] Although formed with a thermally conductive good ingredient, if the individual heat sink 20 for colors and the individual heat sink 40 for blacks are small compared with the conventional heat sink 61 for colors, and the heat sink 62 for blacks and independent, they are not only the magnitude which can radiate enough the heat generated with the head chip 19 for colors, and the head chip 39 for blacks. Therefore, the individual heat sink 20 for colors and the individual heat sink 40 for blacks are thermally combined with both the common heat sinks 52. Between the individual heat sink 20 for colors and the individual heat sink 40 for blacks, and the common heat sink 52, although it is good to only even carry out a pressure welding, it is good to attach so that thermal resistance may decrease, for example with silver epoxy, a pewter, etc.

[0027] Gage pins 21 and 41 are formed in the individual heat sink 20 for colors, and the individual heat sink 40 for blacks, respectively, and the positioning is made in case it is attached to the common heat sink 52. When making into a main scanning direction the sense which carries out an abbreviation rectangular cross in the direction of a nozzle configuration of the head chip 19 for colors, and the head chip 39 for blacks and making into the direction of vertical scanning the direction which intersects perpendicularly with a main scanning direction, the individual heat sink 20 for colors and the individual heat sink 40 for blacks which were attached estrange only the amount of setup to a main scanning

direction, and are arranged in the direction of vertical scanning at an abbreviation same location.

[0028] Moreover, on the individual heat sink 20 for colors, and the individual heat sink 40 for blacks, the flexible printed circuit board for colors and the flexible printed circuit board for blacks are prepared, respectively, those edges are bent by inverse L-shaped and the contact pads 21 and 41 for aiming at electric connection with the common heat sink 52 into the part are formed. The head chip 19 for colors and the head chip 39 for blacks are electrically connected by wirebonding etc. between this flexible printed circuit board for colors, and the flexible printed circuit board for blacks. What is necessary is to be also able to constitute it from a metal substrate which arranged the printed circuit as the individual heat sink 20 for colors, and an individual heat sink 40 for blacks as usual, to bend a metal substrate to inverse L-shaped in this case, and just to form the contact pads 21 and 41 in that bent part.

[0029] It is the metal substrate which arranged the printed circuit on the aluminum substrate, and the common heat sink 52 is electrically connected by the contact member for example, by the side of the contact pads 21 and 41 and the common heat sink 52 which is not illustrated, in case this printed circuit attaches the individual heat sink 20 for colors, and the individual heat sink 40 for blacks to the common heat sink 52. Moreover, it also has the connector area 54 for connecting with the body of a printer electrically. On the common heat sink 52, the thermistor for detecting the temperature of this common heat sink 52 can also be attached.

[0030] In order to attach the individual heat sink 20 for colors, and the individual heat sink 40 for blacks with a sufficient precision, the fitting hole 53 is established in the common heat sink 52. The gage pins 21 and 41 prepared in the individual heat sink 20 for colors and the individual heat sink 40 for blacks are inserted in each fitting hole 53. Both are desirably good to paste up so that thermal resistance may become small with silver epoxy etc. Furthermore, opening 55 is formed in the common heat sink 52, and when the individual heat sink 20 for colors and the individual heat sink 40 for blacks are attached, it constitutes so that the color ink induction 16 of the joint member 14 for colors and the black ink induction 36 of the joint member 34 for blacks may penetrate the common heat sink 52 and can connect with a projection and the ink tank which is not illustrated.

[0031] The common heat sink 52 is somewhat smaller than the magnitude of each conventional heat sink, or has the magnitude more than an EQC. Therefore, when it sees from each head chip, it will have the heat sink more than the former and an EQC.

[0032] With the configuration of the conventional print head, what can respond to generation of heat when the print head works fully was used, and it needed to have the heat sink of each print head subassembly by the head chip which uses this. This is because a user can print any patterns. However, by the actually printed pattern, although it exists also black 100% and yellow 100%, the pattern which prints black 100% and yellow 100% to coincidence does not exist. That is, a color and the calorific value of black are total, it is 100% or less and a heat sink required of the whole print head is good with one head chip.

[0033] With this configuration, the heating value generated during 1 band printing with the head chip 19 for colors and the head chip 39 for blacks gets across to the individual heat sink 20 for colors, and the individual heat sink 40 for blacks, and carries out the temperature up of this, respectively. Size is decided that, as for the individual heat sink 20 for colors, and the individual heat sink 40 for blacks, the temperature up at this time does not become excessive. Since thermal resistance is small attached in the common heat sink 52, this heat diffuses promptly the individual heat sink 20 for colors, and the individual heat sink 40 for blacks to the common heat sink 52. The common heat sink 52 carries out stripping of the sum of a color and the generating heating value of both of black to the inside of atmospheric air, and carriage. It is total and is 100% or less, and one head chip is sufficient as heat sink capacity, and it can reduce cost and ***** by half mostly compared with the former so that the sum of this generating heating value may be mentioned above.

[0034] In addition, with the configuration which prepares a respectively different head chip, for example about each color of black ink and color ink, the head chip which carries out the regurgitation of the ink of colors other than black ink may perform 100% of printing to coincidence, when printing false black, for example. In this configuration, the common heat sink 52 should just set up magnitude supposing the

case where head chips other than black perform 100% of printing. Thus, the magnitude of the common heat sink 52 takes into consideration the total heat generated in coincidence, and should just set up the magnitude of the common heat sink 52.

[0035] With the configuration using such a common heat sink 52, even if it is the case where only black is used, the both print head subassembly for propagation, the object for colors, and blacks in heat is arranged with the temperature of an abbreviation EQC through the common heat sink 52. Consequently, similarly fluctuation of the amount of drops in which the color ink by temperature and black ink fly takes place, and change of a hue is controlled. Furthermore, it is possible to only use a thermistor for one common heat sink 52, in case head temperature is detected, and to treat as a color and temperature of the head of both of black. Therefore, while being able to reduce components mark, such as a thermistor, a thermal control circuit can be simplified.

[0036] Furthermore, a preheat treatment is performed in order to control head temperature in a low-temperature environment proper. The half pulse temperature up who a pulse with short extent which does not perform the ink regurgitation is given [half], and makes it generate heat for a head chip as this remaining-heat processing is used. At the time of this preheating, by driving a color and both the heads of black to coincidence, a twice [over the past] as many heating value as this can be given to the common heat sink 52, and warm-up time can be shortened.

[0037] For example, with the configuration in which all head chips may carry out 100% of printing to coincidence only using color ink, although, as for the magnitude of the common heat sink 52, the magnitude corresponding to total of the magnitude of the conventional heat sink is needed and the effectiveness like ** is not acquired in respect of cost and weight, the effectiveness by equalization of above-mentioned head temperature can be acquired.

[0038] Housing 51 is equipped after attaching the print head subassembly for colors, and the print head subassembly for blacks to the common heat sink 52. What is necessary is just to attach the common heat sink 52 to extent which shakiness etc. does not produce by migration of carriage etc., since the relative position of the head chip 19 for colors and the head chip 39 for blacks is being fixed by the fitting hole 53 of gage pins 21 and 41 and the common heat sink 52 at this time. At this time, attaching to housing 51 exchangeable is also possible. The head chip 19 for colors and the head chip 39 for blacks can make ink fly from opening of the pars basilaris ossis occipitalis of housing 51 to a projection and the recorded media which are not illustrated by attachment. Moreover, the cable for connecting electrically the connector area 54 of the common heat sink 52 with a projection and the body of a printer from opening of the tooth back of housing 51 etc. is connected.

[0039] Usually, housing 51 is carried in the carriage of a printer and constituted by the main scanning direction movable. At the time of use of a printer, joint opening of the ink tank which is not illustrated to each color ink induction 16 of the joint member 14 for colors and the black ink induction 36 of the joint member 34 for blacks is connected. The color ink in an ink tank is supplied to the head chip 19 for colors through the joint material 18, a filter 17, the color ink induction 16 of the joint member 14 for colors, and the crevice 12 of the manifold member 11 for colors. Similarly, black ink is supplied to the head chip 19 for blacks through the joint material 38, a filter 37, the black ink induction 36 of the joint member 34 for blacks, and the crevice 32 of the manifold member 31 for blacks from an ink tank.

[0040] In above-mentioned explanation, although the print head of a thermal ink jet method was explained, this invention is applicable not only to this but print heads which have other heating elements, such as a print head of a thermal method.

[0041]

[Effect of the Invention] Since the heat sink prepared in the former corresponding to each head chip was communalized according to this invention so that clearly from the above explanation, the heat sink of a print head was reduced and it became possible about the print head cheapness and to suppose that it is lightweight. Although based also on the configuration of a print head, it is possible to reduce to one parenchyma top head chip.

[0042] Moreover, by having communalized the heat sink, the temperature of each print head subassembly could be arranged almost equally, the property in each head chip was arranged, and it

became easy to maintain high definition. For example, in the print head of a thermal ink jet method, since it generates in common, fluctuation of the amount of ink droplets breathed out from each head chip can control change of a hue at the time of a color-print, and can maintain image quality. Moreover, it can simplify a thermal control circuit while it can reduce the components mark for temperature detection, since it means that detection of head temperature had measured the temperature of two or more head chips only by measuring the temperature of a common heat sink. Furthermore, by driving all head chips to coincidence at the time of a preheating, generation of heat of the number twice of a head chip can be given to a common heat sink, and according to this invention, there is various effectiveness -- warm-up time can be shortened.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the decomposition perspective view showing one gestalt of operation of the print head of this invention.

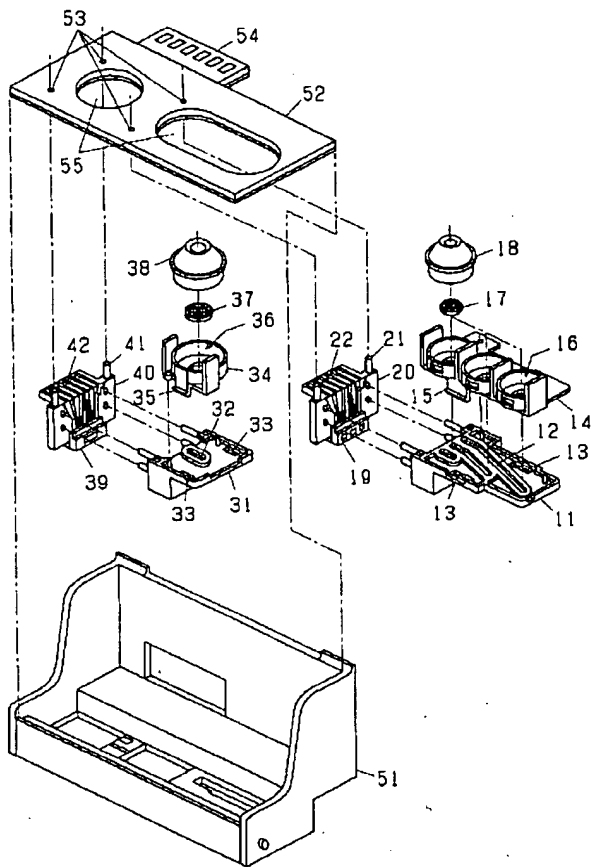
[Drawing 2] It is the decomposition perspective view showing an example of the print head of the conventional thermal ink jet mold.

[Description of Notations]

11 [-- The joint member for colors,] -- The manifold member for colors, 12 -- A crevice, 13 -- A hole, 14 15 [-- Joint material,] -- A claw part, 16 -- Color ink induction, 17 -- A filter, 18 19 -- The head chip for colors, 20 -- The individual heat sink for colors, 21 -- Gage pin, 22 -- A contact pad, 31 -- The manifold member for blacks, 32 -- Crevice, 33 [-- Black ink induction,] -- A hole, 34 -- The joint member for blacks, 35 -- A claw part, 36 37 -- A filter, 38 -- Joint material, 39 -- The head chip for blacks, 40 -- The individual heat sink for blacks, 41 -- A gage pin, 42 -- Contact pad, 51 [-- A connector area, 55 / -- Opening, 61 / -- The heat sink for colors, 62 / -- The heat sink for blacks, 63 / -- Housing, 64 / -- Common connector area material.] -- Housing, 52 -- A common heat sink, 53 -- A fitting hole, 54

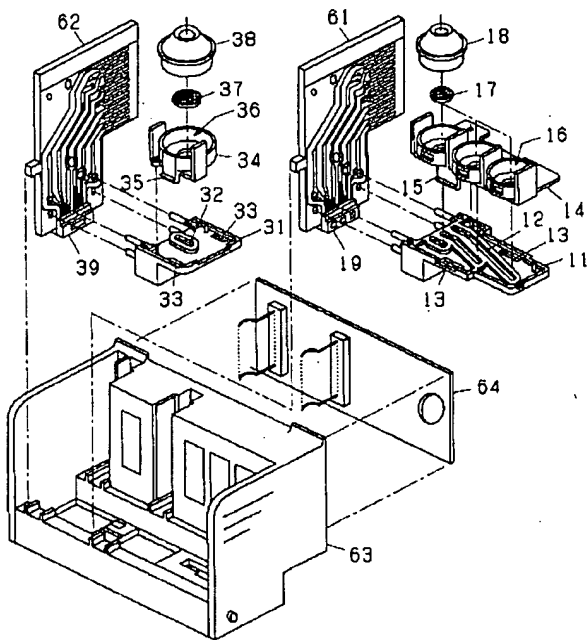
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